

## HUMPBACK WHALE SURVEY ALONG THE WEST COAST OF AUSTRALIA: A COMPARISON OF VISUAL AND ACOUSTIC OBSERVATIONS

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The results of a survey of humpback whales, using visual and acoustic detection techniques, along the Western Australian coast during the winter and spring of 1989 are reported.

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The migratory cycle of humpback whales (Dawbin, 1966), and the population characteristics of Area IV humpbacks (Chittleborough, 1965) and their increase in abundance in Area IV since exploitation ceased in 1962 (Bannister, 1990) are well known. Less well studied is distribution of Area IV animals off Western Australia, when they congregate in warm inshore waters to breed. This study was conducted from a 20m schooner, the R/V "Thistlethwayte", while on a circumnavigation of Australia during the austral winter and spring of 1989. The voyage allowed a survey of inshore waters along the Western Australian coast during the humpback breeding season.

Acoustic and visual detection of whales has been used to determine migration routes. Folkow and Blix (1990) detected several species during a sound survey of the mid-Atlantic, while Clapham and Mattila (1990) detected humpback song at sea in the western Atlantic, distant from land. Studies of humpback song on breeding grounds elsewhere are well known and too numerous to list here, but humpback sounds are known to be indicators of stock identity (Payne and Guinee, 1983), and songs from Western Australia have been shown to differ from those on the east coast (Dawbin and Eyre, this memoir). WHD and Chris Burton have recorded humpback sounds in various latitudes off the Western Australian coast, as far south as Cape Leeuwin (34° 20'S). It was therefore decided to use acoustic and visual observations to monitor humpbacks during the southward passage.

The vessel left Darwin in mid July 1989, and sound samples were taken at intervals of no more than four hours, navigation and weather permitting, while at sea. The vessel stayed as close to the coast as was navigationally prudent. On July

24, humpbacks were first encountered visually and acoustically at 15° 17'S, 123° 52'E. This was considerably further north than the generally accepted limits of Area IV breeding grounds (Harrison and Bryden, 1988), though fisherfolk familiar with these waters later reported that humpbacks are commonly seen in the area (P.Canney, pers.comm.). We regarded our timing as favourable, because the majority of whales are still moving north at this time.

Sound was monitored over 33 days at more than 100 stations, with 92 stations between the first and last recordings; stations spanned 15° of latitude and 1600 nautical miles. Generally the weather was calmer north of Broome, with frequent short spells of bad weather to the south.

Sightings and sound recordings were made as far as 30° 24'S, with animals being detected three times as often by sound as by sight. A total of 40 humpbacks were sighted on 21 occasions, and a conservative total of 127 heard on 64 occasions. Conservative, because when more than one animal was singing faintly, it was often difficult to distinguish how many were singing. In these cases, the minimum definite number was recorded. Animals were heard singing at all times of the day and night. Humpback sounds typically consisted of a "chorus" of several animals singing the same song, apparently independently of each other. Occasionally "social" (non-song) sounds were heard, often during observed vigorous displays of social behaviour, as described by Silber (1986). Only at 23 (25%) stations were no whales detected at all. In 13 of these, detection may have been hampered by surface waves (sound), or by darkness or whitecaps (sight).

Dawbin (1956) discussed factors affecting the coastal migration routes of humpbacks. To these

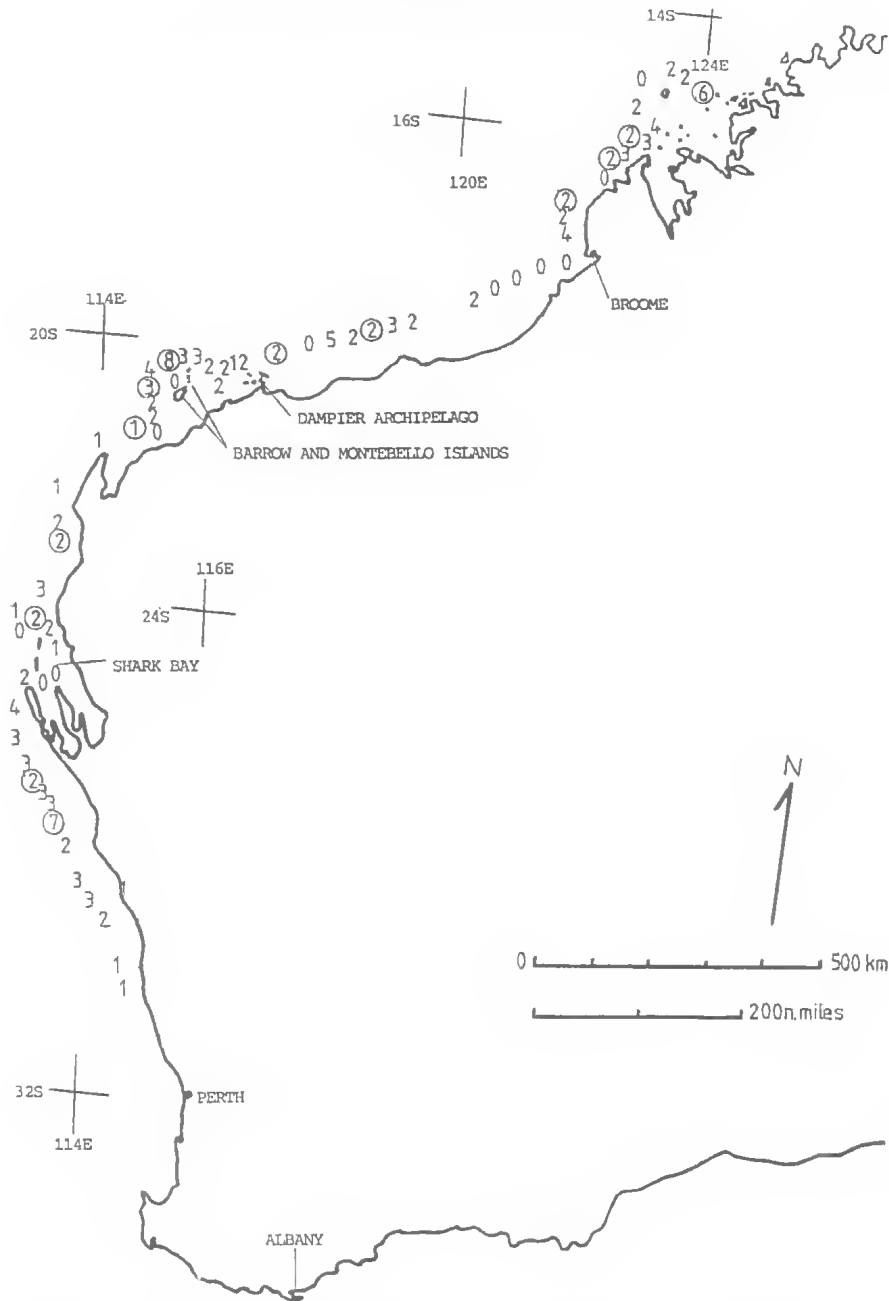


FIG. 1. Map of Western Australia, showing numbers and locations of humpback whales located during the survey. Animals detected by sound alone are denoted by a plain number; those detected visually are denoted by a circled number. This does not mean that the sightings and soundings are mutually exclusive; sound was often detected during sightings. Not all monitoring stations are shown.

we must add consideration of the possible effects of large-scale offshore oil and gas development. Gas rigs in the vicinity of Barrow Island created mechanical underwater noise levels which would certainly hinder cetacean communication,

and which may even have resulted in a localised modification of the humpback migration path. Bowhead whales in the Beaufort Sea have shown avoidance behaviours in response to oil exploration and drilling (Richardson et al., 1985, 1986).

The extent of Area IV humpback breeding grounds is still undetermined. Townsend (1935) showed that humpbacks were taken off the northwest coast, west of Broome. In this study, almost all of the animals observed south of Broome were travelling in a northward direction, while animals to the north of Broome were generally static. Two cows with young calves were seen north of Broome, a town previously regarded as the extreme northern limit of the breeding area: these were the only calves seen during the survey. This indicates a wide latitudinal range in which humpbacks may calve: parturition has been reported as far south as Albany, at 35°S (Chittleborough, 1965). Water temperatures and depth profiles north of Broome are comparable to those of humpback breeding areas in the West Indies (Whitehead and Moore, 1982). Animals apparently engaged in courtship were also observed north of Broome.

Visual monitoring would have indicated only 1/3 the whales detected by hydrophone. This is despite the fact that Humpback songs are regarded as being almost exclusively produced by males. Past catch records indicate that females occur in almost equal abundance off W.A.

Acoustic monitoring has the advantage of being able to operate in darkness or reduced visibility; even in reasonable conditions whales may evade visual detection where they are not expected. In 1986 WHD recorded humpback sounds off Rottnest Island near Perth, when there had been no visual reports for many years. The combined results of this survey, and earlier surveys by WHD and Chris Burton show that humpbacks vocalise, and can therefore be monitored acoustically, along the Western Australian coast between 15–34°S.

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